

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to a Method of and Apparatus for Moulding and Assembling Complementary Parts

We, GILLETTE SAFETY RAZOR COMPANY, a corporation organized and existing under the laws of the State of Delaware, United States of America, having a place of business at 15, West First Street, Boston, Massachusetts, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of forming and assembling moulded articles having mating parts and to apparatus for use in practising certain steps of the method.

In the manufacture of such articles heretofore, the mating parts have been moulded separately, generally in multiple cavity moulds, and subsequently assembled, usually by hand. Assembly has been a time-consuming and expensive operation and, further, in multiple cavity moulding, has necessitated exact duplication of all the moulding cavities of each mould, so that each part from one mould will fit every part from the other mould.

An object of this invention is to provide a novel method of moulding and assembling the mating parts of such articles by which the assembling process is simplified and made capable of automatic machine operation, thereby substantially reducing the cost of manufacture. Another object is to provide a moulding and assembling method in accordance with which a part from a given cavity of a first multiple cavity mould or mould section is invariably assembled with a part from a particular cavity of a second multiple cavity mould or mould section. Still another object of the invention is to provide a novel machine for performing the assembly steps of the process. Other objects and advantages of the invention will hereinafter appear.

According to the preferred practice of the method of the invention, the mating parts are moulded in a single multiple cavity mould in which the differently shaped cavities for the two mating parts are arranged in predeter-

mined opposite alignment. The aligned pairs of opposite cavities are connected to the source of fluid moulding composition via corresponding feeder pairs fed from a common runner. On hardening, the moulding composition in the feeders and runner serves to connect all the moulded parts together and maintains the predetermined alignment of each pair of mating parts when the moulded piece is removed from the mould.

The moulded piece is maintained intact until the assembling operation. This operation involves severing the pairs of mating parts from the feeders at the points of the in-gates, moving the severed parts of each mating pair into juxtaposition along a path predetermined by their relative arrangement while connected to the runner and joining the juxtaposed parts. Since each part is invariably assembled with a mating part from a particular cavity in the opposite part of the mould, the preparation of the mould is greatly simplified, it being no longer necessary as heretofore to observe tolerances assuring interchangeability of the parts. Even with careful control of the tolerances, difficulties are not infrequently experienced under the prior practice where the parts must fit closely, because the rate of cooling of a filled mould or a "shot" is seldom uniform over its entire area, a fact making for differences in the extent of shrinkage of the parts ultimately sought to be mated.

To perform the assembling operation, the invention includes a machine having a cutting bed shaped to receive the moulded piece comprising the runner and connected parts. As disposed on the cutting bed, the mating parts of each pair overlies individual receiving retainers arranged in accordance with the pattern of arrangement of the parts on the runner. The parts of severed at the in-gates by a cutting mechanism, preferably simultaneously, are received and held momentarily in the corresponding retainers, and are then moved along predetermined paths to bring each pair of mating parts into the position in which they are joined.

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In the accompanying drawings, the process and apparatus of the invention, in their preferred forms, are illustrated as applied to the production of a hair curler composed, of two moulded mating parts. It will be understood, of course, that the curler shown in the drawings is merely illustrative of a general class of moulded articles to the production of which the invention is applicable.

10 In the drawings;

Fig. 1 is a view, partly in vertical section, partly in side elevation, of assembly apparatus according to the invention, this view showing in full lines the runner and connected mating 15 curler parts in an initial position preliminary to cutting and in dotted lines the position of the parts upon cutting;

Figs. 2 and 3 are vertical sectional views of part of the apparatus of Fig. 1, showing the position of parts upon completion of assembly 20 and during discharge of the assembled curlers;

Fig. 4 is a top plan view, with portions broken away, of the cutting bed and retainers of the apparatus shown in Fig. 1;

25 Fig. 5 is a broken side elevation of the plunger mechanism of Fig. 1;

Fig. 6 is a longitudinal section on the line 6-6 of Fig. 2;

Fig. 7 is a top plan view of a slide mechanism forming part of the apparatus of Fig. 1;

Fig. 8 is a broken plan view showing the moulded piece comprising the curler parts as it comes from the mould.

Fig. 9 is a view of the assembled curler.

35 Referring now to the drawings, and first to Figs. 3, 8 and 9, the curler to be moulded and assembled by the process and apparatus as illustrated, is shown assembled in Fig. 3 and again in Fig. 9 and consists of a rod R and 40 clasp C which are moulded as separate parts of any suitable material such as polystyrene. The rod has at one end an extension on which is formed a ball B and at the other end a series of marginal notches N which surround the 45 mouth of a recess or socket N¹. The clasp has at one end a pair of opposed laterally yieldable flanges F having aligned openings O providing a socket receiving the ball B which is pressed thereinto to form a swivel joint. The opposite 50 end of the clasp is hooked and is provided with an inwardly projecting tab T which is received in the socket N¹ and held against rotary movement by the notches N. In use of the curler, tab T is freed from the socket N¹ 55 of the rod by separating the tab end of the clasp from the notched end of the rod, the rod being thereafter freely rotatable about its own axis in the hair-winding or curl-forming operation. Once the curl is formed the tab T 60 is re-inserted into the socket N¹ to lock the curl against unwinding.

Although, as indicated, assembly of the two parts R and C in working relation is completed merely by pressing the ball B between 65 flanges F into the socket O, for convenience

in packaging we prefer to couple them at their opposite ends as well.

In accordance with the preferred practice of the method of the invention and as shown in Fig. 8, the mating parts R and C of the device 70 are moulded in a single multiple cavity mould in which the feed lines are arranged to provide a runner G and feeders A connecting all of the parts together in predetermined relation. As shown, the runner has a projection 75 P corresponding to the mould gate and each feeder is attached to one of the parts R or C, uniformly spaced along the opposite sides of the runner.

It will be observed that the body portion 80 of each part C is substantially aligned with the axis of a part R but that the feeders stand in a staggered relation. This arrangement of the feeders is not an essential or critical feature of the invention, but coincides with the 85 arrangement of parts in the particular assembling apparatus shown in the drawings and to be hereinafter described.

The mould normally used to produce the integral structure of Fig. 8 is of the injection 90 type. While the cavities therein which correspond to the parts R and C are formed to tolerances providing for close interfitting of the parts, these tolerances need not be uniform over the mould as, any part needs only to fit 95 its opposite mating part. The resultant relative simplicity of forming the moulds is, as previously stated, one of the substantial advantages of the invention.

In the moulding operation, the opening between the two flanges F of the part C and the notches N and the socket N¹ may be formed in a manner well understood in the art by means of retractable cores. Feeders A are so 100 formed that they are of reduced cross-section at the points of juncture with the curler parts, the subsequent severing of the parts being thereby facilitated. These points of reduced 105 cross-section correspond with the in-gate portions of the mould.

110 Referring now particularly to Figs. 1 and 4 illustrating the essential parts of the apparatus employed in the assembling of the curler parts, loading of the apparatus is accomplished simply by depositing the moulded piece or 115 "shot" on the bed 10 which presents a recess 12 receiving the projection P on the runner, registry means in the form of lugs 14 between which the feeders A are received and elements 15 which lend support to the notched ends of 120 the rods R.

Positioned above the bed 10, more particularly over the runner and feeder supporting portion 9 thereof, is a plunger bar 16, extending the length of the bed and vertically 125 reciprocal in end guideways 18 and 20, having cutting edges 22 spaced in correspondence with the distance between the attenuated end portions of the opposed feeders A and co-operating with like edges on portion 9. This 130

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plunger is actuated as by mechanical or fluid pressure means, not shown, through levers 24 at either end thereof fulcrumed at 26 and connected to the plunger via linkages 28.

- 5 Also extending the length of the bed 10, is a second plunger member 30 having fingers 32 (see Fig. 5) corresponding in number to the rods R. Plunger 30 is mounted to reciprocate in the right hand channels of guideways 20 (Fig. 1) and in a third pair of guideways 34, these, like guideways 20, being positioned one at either end of the plunger. Actuation of the plunger 30 is accomplished through a pair of levers 38, each of which is connected to the plunger at one end thereof through a linkage 36.

- On severing of the parts R and C from the feeders by the edges 22 of the cutting plunger, the severed parts fall into retaining cavities 40 and 42, respectively. Parts C, as they descend, turn axially through an angle of 90°, this being due to the fact that the main body of each of said parts lies forwardly of the corresponding cavity 46 in which the flanges F are received. Rods R are prevented from rotating or from becoming longitudinally displaced as they fall into the cavities 40 by the elements 15 which continue to be embraced by the notched ends of the rods. In Fig. 1 the positions of the two parts of the curler following the cutting or severing is indicated in dot and dash lines.

- It is to be clearly understood that it is within the scope of our invention to form the mating parts using separate multiple cavity moulds providing unitary moulded pieces such as would be formed by splitting or severing the structure of Fig. 8 along the line of the axis of the runner G.

- 40 Cavities 40 in which the parts R are received and retained have a common bottom in the form of the right hand portion (Fig. 1) of a lever-actuated slide 48. The left hand portion of this slide has the form of a grate, the grate openings forming the lower half of the sides and ends of the cavities 42. Slide 48 overlies a second lever-actuated slide 50 which works at right angles to the slide 48 in a guideway provided in part by the plate 52, representing the common bottom of the cavities 42. This slide, as shown in Fig. 7, has the form of a grate throughout its length. Partitions 53 between the grate openings 54 in slide 50 under-support parts C as they are carried under the parts R by the slide 48 and undersupport both parts during the snapping of the two together by the plunger fingers 32 (Fig. 2). It is to be observed that the spacing between the depending ends of the elements 15 and the upper surfaces of the tabs T of the clasp members, as represented in Fig. 2, is such that as the rods are forced downwardly by the plunger fingers, the tabs become embraced within the notches N before the rods lose contact with these elements. This arrangement effectively avoids any

possibility of lateral displacement or rotation of the rods.

To release the assembled curler, slide 50 is moved so that the openings 54 are brought into registry with the corresponding openings 70 of the upper slide 48 and the plunger fingers 32 forced further downwardly, this action assuring positive discharge of the curler.

It is understood that the invention in its apparatus aspects will not be considered as restricted to the details of construction shown in the drawings, since various changes and modifications, such as those dictated by practical considerations including the form of the pieces to be assembled, may obviously be made without departing from the scope of the invention or sacrificing the advantages derived from its use.

What we claim is:—

1. A method of moulding and assembling together pairs of mating parts in multiple which comprises moulding and hardening said parts in groups of non-mating parts in a manner whereby the parts in each group are linked together by excess hardened moulding material in proper spaced relation for joining with the parts in the other group, each part of one group being dimensioned complementarily with relation to a particular part in the other group, severing the parts from the excess moulding material while maintaining each part in a predetermined relation with respect to its complementary part, juxtaposing the severed parts for assembly and joining the juxtaposed parts.
2. A method according to claim 1, wherein each part of one group is dimensioned to fit a particular corresponding part of the other group, and said groups are positioned together for cutting with each part of one group held by its uniting portion in predetermined alignment with said particular part of the other group which it is dimensioned to fit, said parts of each group being severed from the uniting portion while preserving said alignment, and said aligned parts being moved relative to one another to juxtapose said parts for assembly and said juxtaposed parts being pressed together.
3. A method of moulding and assembling together, in multiple, pairs of mating parts, which comprises moulding and hardening a plurality of pairs of said parts in a manner to provide a continuous portion of hardened moulding composition extending between and uniting said pairs of parts together in a single structure with the pairs of each pair held in predetermined opposite alignment, cutting said parts from said portion while maintaining a uniform opposite alignment of the parts of said pairs, relatively moving said aligned parts to juxtapose the parts of each pair into proper position for assembly, and pressing said juxtaposed parts together.
4. A method according to any one of the

preceding claims, which comprises forming a unitary moulded structure including a runner portion and all of said parts to be assembled, said parts being individually linked to the runner through feeders with the mating parts aligned in spaced relation on opposite sides of the runner, simultaneously severing the parts from the feeders while maintaining said structure on a generally horizontal plane and while maintaining the opposite alignment of the parts, simultaneously shifting all of the parts which had been attached at one side of the runner under the parts which had been attached at the other side of the runner and joining the parts by forcing the last said parts downwardly into engagement with the other of said parts.

5. A method according to claim 4 for the manufacture of moulded plastic hair curlers of the type comprising a rod member and a clasp member adapted to be snapped together, wherein the rod members are aligned on one side of the runner and the clasp member on the other, said members being simultaneously snapped together by forcing the rod member downwardly into engagement with the clasp member.

6. Apparatus for moulding and assembling pairs of mating parts in multiple according to claim 1, comprising a multiple cavity mould in which the differently shaped cavities for the two mating parts are in opposite alignment, aligned pairs of opposite cavities being connected or connectible to a source of fluid moulding composition via corresponding feeder pairs fed from a common runner, and a bed portion adapted to receive a unitary structure comprising the pairs of parts and a body portion to which the parts are individually linked in spaced relation with the mating parts on opposite sides in said predetermined alignment, individual retainer means being provided at a level below the level of the unitary structure as deposited on the bed, said retainer

means being spaced and arranged as determined by the spacing and arrangement of the mating parts in said unitary structure, the retainers corresponding to the parts on one side of said body portion being of a depth greater than the other retainers, means being provided for so severing the parts from said body portion that the parts are caught by said individual retainer means, and means being provided for juxtaposing the severed parts for assembly and means for pressing the juxtaposed parts together.

7. Apparatus according to claim 6, wherein said retainers corresponding to the parts on one side of said runner are of a depth greater than the other retainers and plunger means are provided for simultaneously severing the parts from said feeders, means being provided for maintaining the said predetermined opposite alignment during the severing and slide means being utilized for juxtaposing the severed parts for assembly.

8. Apparatus according to claim 7, including slide means for shifting the parts received in the deeper retainers under the parts received in the other retainers, plunger means for forcing the parts in the last-mentioned retainers into engagement with the parts shifted from the deeper retainers and separate slide means for releasing the assembled parts from the apparatus, said bed being horizontal.

9. The method of moulding and assembling together pairs of parts in multiple, substantially as hereinbefore described.

10. Apparatus for assembling pairs of moulded mating parts in multiple substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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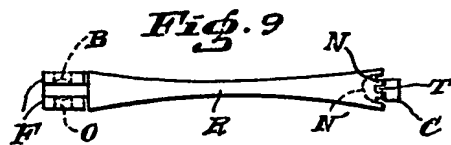
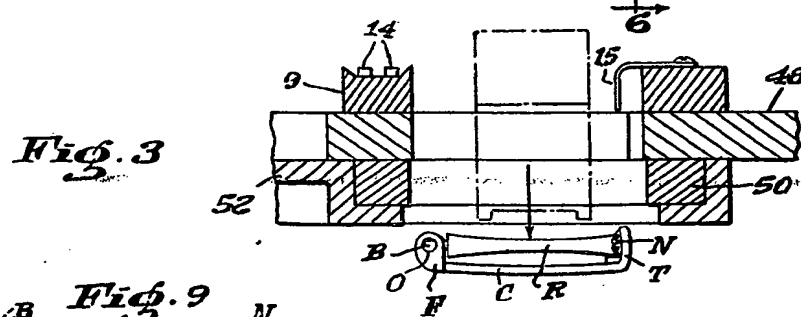
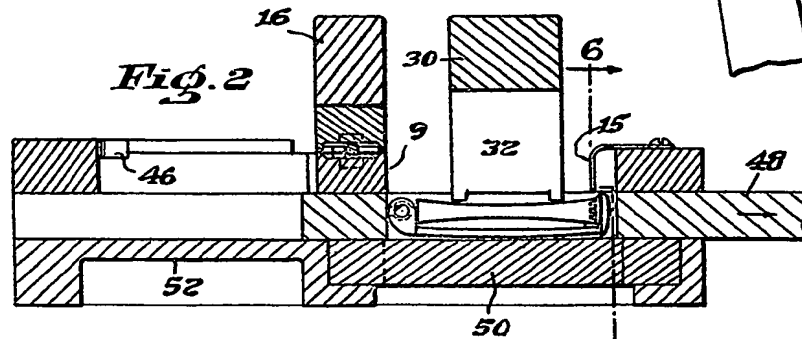
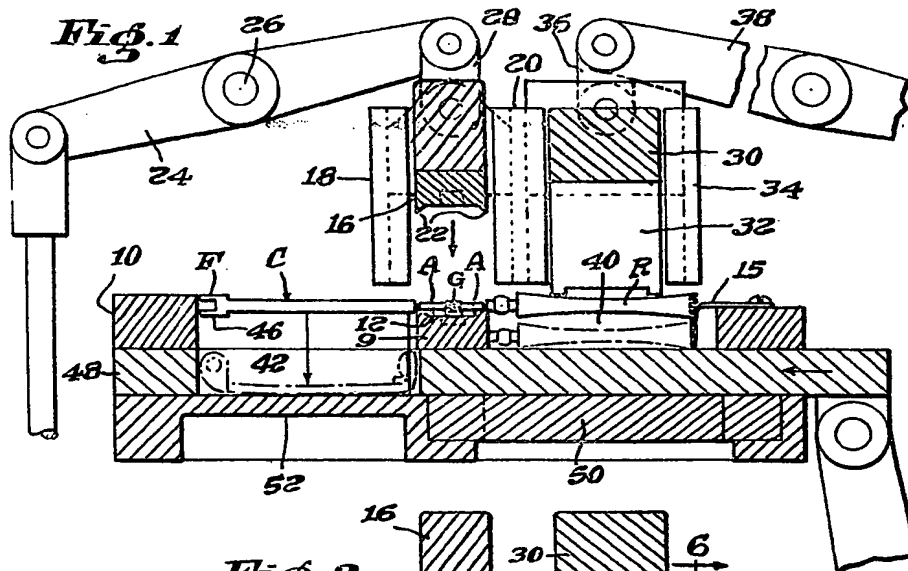
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3 SHEETS

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SHEET 1



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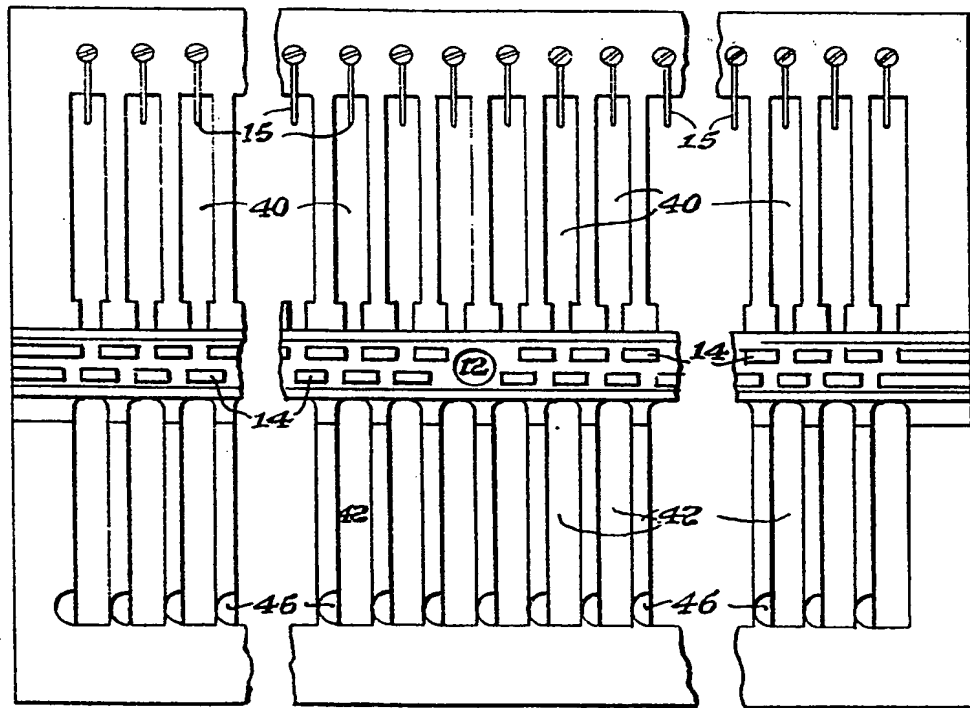


FIG. 4 10

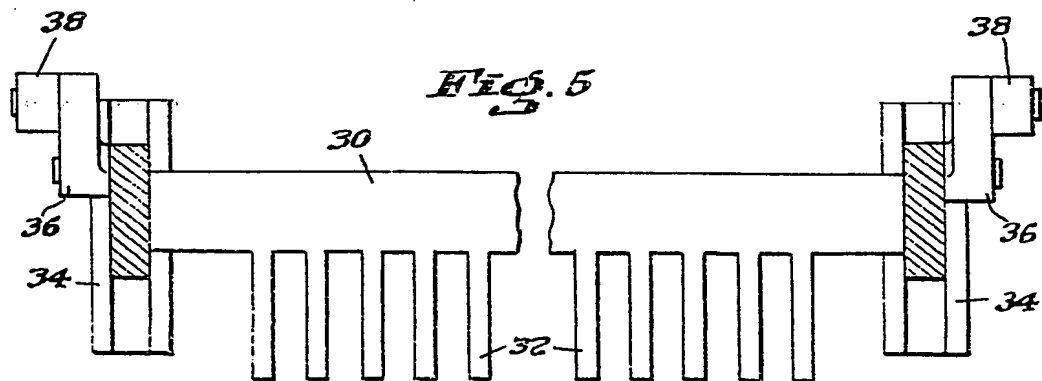


FIG. 5

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SHEETS 2 & 3

Fig. 6

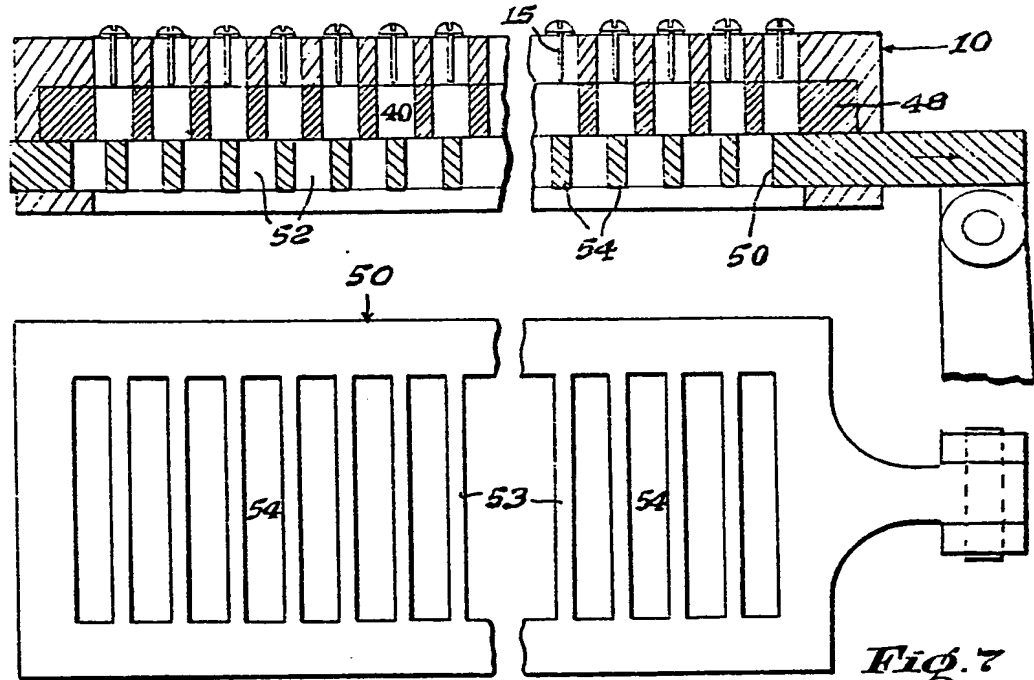


Fig. 7

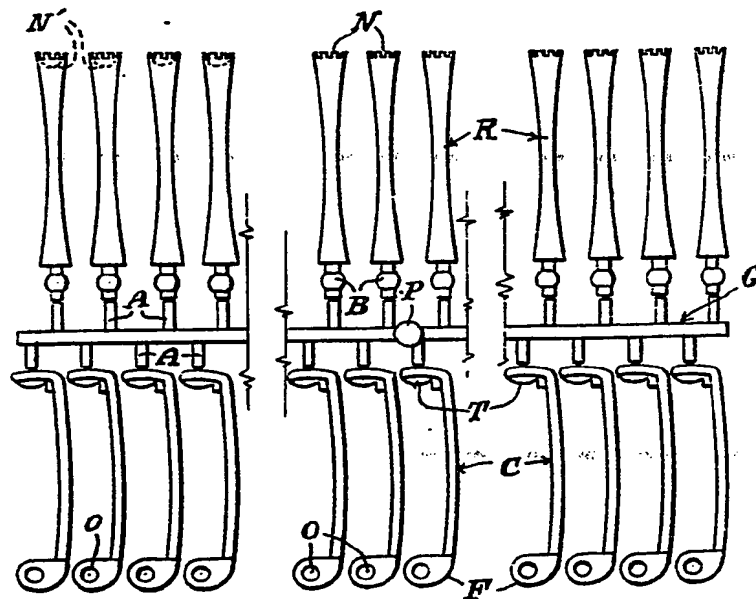
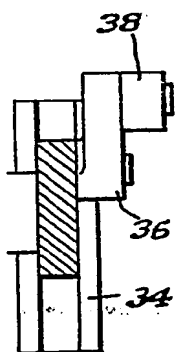
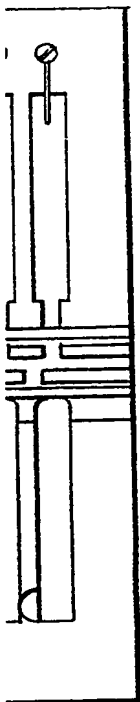


Fig. 8



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Fig. 6

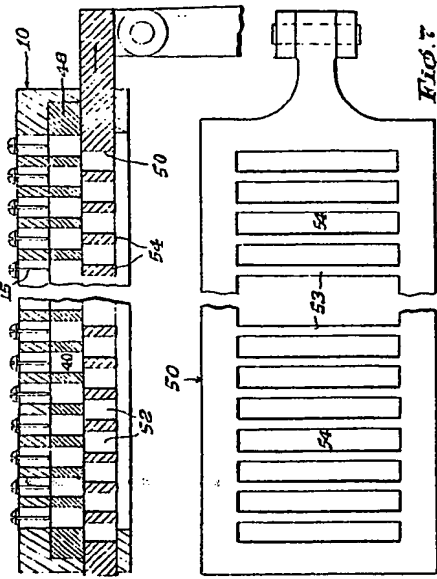


Fig. 7

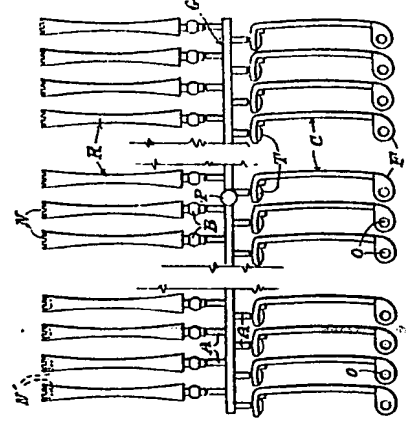


Fig. 8

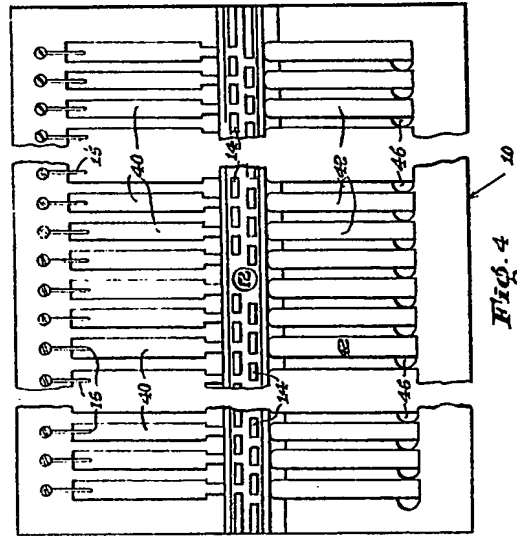


Fig. 4

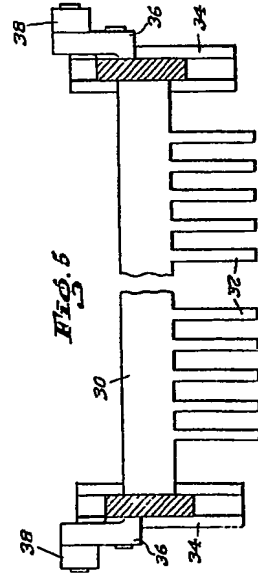


Fig. 5

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